
Remote access to electronic library services through a campus network*

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The Health Science Library at University of Tennessee (UT), Memphis has taken advantage of a campuswide network for the purpose of providing enhanced access to library services. With a terminal or microcomputer, members of the UT Memphis community can use an electronic menu system to complete photocopy, interlibrary loan, and computer literature search request forms; leave messages or sign up for library workshops; use electronic mail to receive citations and abstracts from computer literature searches; use an electronic bulletin board to scan the library's new acquisitions lists, library hours, services, and policies; and use bibliographic retrieval software to search the library's locally mounted databases. Remote access to library services and electronic resources, which is available twenty-four hours a day, could potentially save users time and the institution money. Remote access, however, is intended to supplement, not to supplant or discourage, in-house library use.

INTRODUCTION

In the 1982 report *Academic Information in the Academic Health Sciences Center*, Matheson and Cooper described three stages, spanning a twenty-year period, in the evolution of technology applications in information handling [1]. One of the goals of stage one technology applications was to use electronic networks to bridge "the gap between the user and the information wanted by making the transfer of information through multiple (computer) systems both rapid and practical" [2]. Faculty, students, and staff would be able to use microcomputers connected to an electronic network to search library databases and request information from the library. The library us-

ing microcomputers would be able to electronically deliver information obtained from computerized sources to the user. The user could then merge this information into a computerized personal information system.

During the 1980s, technological developments in and institutional commitment to campuswide area and local area networks made this scenario reality. The library at the Georgia Institute of Technology provides remote access to its catalog and locally mounted bibliographic databases through a campuswide network [3]. Users may also transmit requests for materials to the library. The university libraries at Lehigh University offer electronic library services, question answering, bibliographic services, and online searching [4]. The library at the Kennedy Institute of Rheumatology in London offers similar services through its institutional network [5]. This article describes how the Health Science Library at the University of Ten-

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nessee (UT), Memphis has taken advantage of a campuswide network for the purpose of providing enhanced access to library services.

BACKGROUND

UT Memphis is the health sciences campus in the state-supported UT system, which consists of four campus sites. UT Memphis is currently composed of seven colleges: Allied Health Sciences, Dentistry, Graduate Health Sciences, Medicine, Nursing, Pharmacy, and Social Work. Approximately 729 faculty members serve a student body of 1,747 and a house staff of 547. Faculty, students, and staff work in any of the twenty-six campus buildings and the seven local hospitals affiliated with UT Memphis. The collections of the UT Memphis Health Science Library and its clinical branch, Stollerman Library, support the programs of the seven health sciences colleges. The collections consist of 162,089 bound volumes and 2,111 current journal subscriptions. Since 1985 the Health Science Library has been housed in a building that is completely wired for voice, data, and video transfer. The library shares the building with others, including the computer center.

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In 1984 the computer center at UT Memphis—now called the Biomedical Information Transfer (BIT) Center—began installation of a high-speed broadband wide-area network (Ethernet) to provide access to institutional computing resources [6]. The network equipment and the NetOne† software supported on it were purchased from Ungermann-Bass Ltd. Over 2,500 ports in fifty campus and affiliated hospital buildings are now served by the network. A user's dumb terminal or microcomputer running terminal emulation software may be connected to one of these ports. By issuing the NetOne command on the dumb terminal or microcomputer, the user may access any computer or modem on the network. The network modems may, in turn, be used to access remote computers not served by NetOne.

During this same period, the university began to encourage and support the use of the Apple Macin-

tosh‡ microcomputer for local data and word processing. In many instances, departmental Macintoshes were networked together to share resources such as file servers and laser printers. A file server is a computer that is connected to a network and functions in file storage. The files stored on the computer file server can be accessed over the network from a user's computer in a manner similar to files stored locally on the user's computer. In addition, different departmental Macintosh local area networks (LocalTalk§) across the campus were linked together for resource sharing. This was accomplished by connecting the LocalTalk network to the campuswide NetOne network through a Fastpath** box, a hardware bridge. The bridge joined the two separate networks into one extended communications network. In addition, individual Macintoshes equipped with an EtherTalk interface card could connect to NetOne to use Macintosh resources in other areas of the campus.

DESCRIPTION AND USE OF ELECTRONIC SERVICES

Electronic library request forms: UT Services Menu

The UT Services Menu (UTMENU) was created specifically for UT Memphis by the computer systems manager. It is available on the VAX computer and allows users to request various departmental services by electronic mail rather than by more traditional methods. The systems librarian worked with the computer systems manager to design and implement the library request forms on UTMENU. To access the UTMENU, the user logs onto VAX and types in "UTMENU." If the user wishes to request library services, "Health Science Library" is selected from the displayed menu. This action calls up the library's menu (Figure 1). From this second menu, the user may request any of the reference, interlibrary loan (ILL), or photocopy services for which traditional paper request forms have been used. For example, if the user wishes to request a photocopy or ILL of a journal article, "4" is typed at the library menu prompt (Figure 1). The first screen displays the standard copyright notice. The user types "C" to continue and is presented with a screen to fill in information about the journal article. After the information for this screen has been entered, the user types "C" to continue. The last screen displayed asks the user to supply personal information. When all the information has been en-

‡ Apple and Macintosh are registered trademarks of Apple Computer, Inc.

§ LocalTalk, EtherTalk, LaserWriter II, and HyperCard are trademarks of Apple Computer, Inc.

** Fastpath is a trademark of Kinetics, Inc.

† NetOne is a trademark of Ungermann-Bass Ltd.

Figure 1
Library UTMENU screen

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                                UT HEALTH SCIENCE LIBRARY MENU

1.  Computer Literature Search Request
2.  Book Request  (Interlibrary Loan)
3.  Book Chapter Request  (Photocopy/Interlibrary Loan)
4.  Journal Article Request  (Photocopy/Interlibrary Loan)
5.  Library Workshops
6.  Send a Message

EX  Exit

                                Enter your choice:

(Press PF2 for Help, TAB or CTRL/H to move cursor, RETURN at end of screen)

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tered, the user types "S" to send the request. Requests for computer literature searches, books, and book chapters are made in a similar manner. The user may also request information about workshops or send messages to the library. Online help in filling out the forms is available, as well as the ability to abort the request session.

The library request forms became available on UTMENU in January 1989. The systems librarian collects the library requests from UTMENU twice a day and sends them electronically to the appropriate library departments. Each department then prints out the requests in preparation for filling them. The filled ILL/photocopy request may be picked up at the library by the requester or sent by campus mail to the requester. Citations and abstracts from computer literature searches may be given to the requester in paper or electronic form. The requester may come to the library to pick up either a printout of the search results or the downloaded search results on diskette, or the search results may be sent to the requester by campus or VAX electronic mail.

Data were collected from January 1989 through June 1989 on the use of the library request forms on UTMENU. For the six-month period, there were 34 UTMENU computer literature requests (3.6% out of a

total 937) and 709 UTMENU ILL/photocopy requests (9% out of a total of 7,895). ILL/photocopy requests accounted for 75% of the total UTMENU library requests. Other libraries offering electronic library request forms have reported a similar pattern of use [7-9]. At UT Memphis, it was not surprising that a higher percentage of ILL/photocopy requests were made via the UTMENU than were computer literature search requests. To request a computer search, the user need only call the reference office and tell a reference librarian what is needed—the user does not have to fill out a form. On the other hand, users must fill out forms to request ILLs or photocopies. Some university departments that have service request forms available on the UTMENU will not accept requests in any other form. The library does not plan to implement such a policy since all library users are not also VAX users. The library offers the electronic service as an alternative to the traditional modes of service, i.e., telephone, campus mail, paper forms.

Electronic bulletin board: LibraryNotes

The library used the VAX Notes Utility to set up a public electronic bulletin board, LibraryNotes. Li-

Figure 2
LibraryNotes topics directory

Notes> █

LibraryNotes				
Created: 7-DEC-1988 16:00		21 topics		Updated: 22-JUN-1989 11:11
Topic	Author	Date	Repl	Title
> 1	UTMEM1::UTLIBRARY	7-DEC-1988	0	Introduction to LibraryNotes
2	UTMEM2::UTLIBRARY	7-DEC-1988	0	Introduction to the Library
3	UTMEM2::UTLIBRARY	7-DEC-1988	0	Library Hours
4	UTMEM1::UTLIBRARY	8-DEC-1988	0	Suggestion Box
5	UTMEM1::UTLIBRARY	8-DEC-1988	0	Telephone Numbers
7	UTMEM1::UTLIBRARY	8-DEC-1988	0	Fines
8	UTMEM1::UTLIBRARY	8-DEC-1988	0	Interlibrary Loans
9	UTMEM1::UTLIBRARY	8-DEC-1988	0	Photocopy Services
10	UTMEM1::UTLIBRARY	8-DEC-1988	0	Reference Services
11	UTMEM1::UTLIBRARY	8-DEC-1988	0	Computerized Search Services
12	UTMEM1::UTLIBRARY	8-DEC-1988	0	Frequently Used Databases
14	UTMEM1::UTLIBRARY	8-DEC-1988	0	Jan '89 New Book List
15	UTMEM2::UTLIBRARY	8-DEC-1988	0	Circulation Policies
16	UTMEM1::UTLIBRARY	8-DEC-1988	0	Book Drops
17	UTMEM2::UTLIBRARY	12-APR-1989	0	Mar '89 New Book List
18	UTMEM1::UTLIBRARY	12-APR-1989	0	May '89 New Book List
More...				

library users who are also VAX users may scan LibraryNotes for information on new acquisitions, library hours, services, and policies. LibraryNotes also allows users to make suggestions to the library. After a short training session, the VAX Notes Utility is easy to use. The user types "notes" at the VMS "\$" prompt to view a list of notes files. To view a list of topics in LibraryNotes, the user types "open LibraryNotes" (Figure 2). To read a topic, the user types in the number of the topic at the notes prompt.

LibraryNotes was made available to VAX users in March 1989, but since there was no means to track its use, it is not known how frequently the bulletin board was accessed. Users are asked to leave suggestions under topic "4," Suggestion Box, but, thus far, the library has received no comments.

Electronic databases: LIS online catalog and miniMEDLINE†††

The Health Science Library began LIS database implementation in January 1989. The miniMEDLINE SYSTEM was the first module installed and was avail-

††† LIS and miniMEDLINE are trademarks of the Dahlgren Memorial Library, Georgetown University Medical Center. MEDLINE is a registered trademark of the National Library of Medicine.

There are three ways members of the UT community can access the LIS databases: by using one of the five terminals in the main library and clinical branch library; by using a terminal or microcomputer in another campus location connected to the university's broadband network, NetOne; or by using a modem and a terminal or microcomputer to dial into VAX.

able for public use in early May 1989. The miniMEDLINE database is a subset of the National Library of Medicine's (NLM) database, MEDLINE, consisting of citations to journals, which are locally owned [10]. At UT Memphis, miniMEDLINE contains citations to articles from 300 journals indexed from January 1987 to the present and is primarily a clinical database with the addition of some basic research sciences journals. The LIS online catalog was the second module installed and was available for public use in early December 1989. Both modules reside on one of the university's VAX computers. There are three ways members of the UT community can access the LIS

databases: by using one of the five terminals in the main library and clinical branch library; by using a terminal or microcomputer in another campus location connected to the university's broadband network, NetOne; or by using a modem and a terminal or microcomputer to dial into VAX. As of the end of February 1990 (eight months), 11,464 miniMEDLINE searches were performed during 4,719 search sessions by 595 different individuals. Since the online catalog had only been available for three months, library users had not yet completely switched from using the card catalog to the online catalog. As of the end of February 1990 (three months), 2,560 searches were performed using the online catalog. An analysis of LIS data by user location is not available.

Electronic databases: MEDLINE Knowledge Server§§

In February 1989, the library installed the Macintosh version of MEDLINE on CD-ROM, Knowledge Server. Knowledge Server is the networked version of Knowledge Finder, which is produced by Aries Systems Corporation. The system included six CD-ROM disks, each containing one year of bibliographic entries with abstracts, and Macintosh-style search and retrieval software, installed on the library's file server connected to a LocalTalk network. The library file server was a Macintosh II with 4 MB RAM and a 40 MB hard disk. Chained to the file server were six Apple CD-ROM players. Five Macintosh work stations and a public access LaserWriter II have been available for use with the system in the library since May 1989. In addition, the university community can access Knowledge Server from any LocalTalk network connected to the campuswide NetOne network by a Fastpath bridge (Figure 3). According to Aries, the networked system supports six to twelve simultaneous users without serious search time degradation.

The system allows the user to perform subject searches either by entering a sentence-style expression (free text) or by selecting search terms from the MeSH dictionary. The user may also perform author or journal title searches. References can be printed to a local printer or downloaded to diskette for later use with a database or word-processing program. Display, print, and download formats can be customized for user needs. In addition, annotations can be added to a reference before printing or downloading it. A pull-down help menu is available. Reviews of Knowledge Finder have characterized it as a system designed specifically for end users; it is simple to use with

somewhat unpredictable free-text searching but excellent access to MeSH [11-13].

For each search conducted, the Knowledge Server program recorded (in an ASCII file residing on the library's file server) the date and time, type of search, search query, search duration, number of references found and their relevancy to the query, and the user's identification. A scanning program was written to convert the data into HyperCard records to generate usage reports. A Knowledge Server version that records the user name became available during January 1990. User names identify the various Macintosh stations on the network. Since all library station user names are known, the data permitted tracking of outside library use of Knowledge Server.

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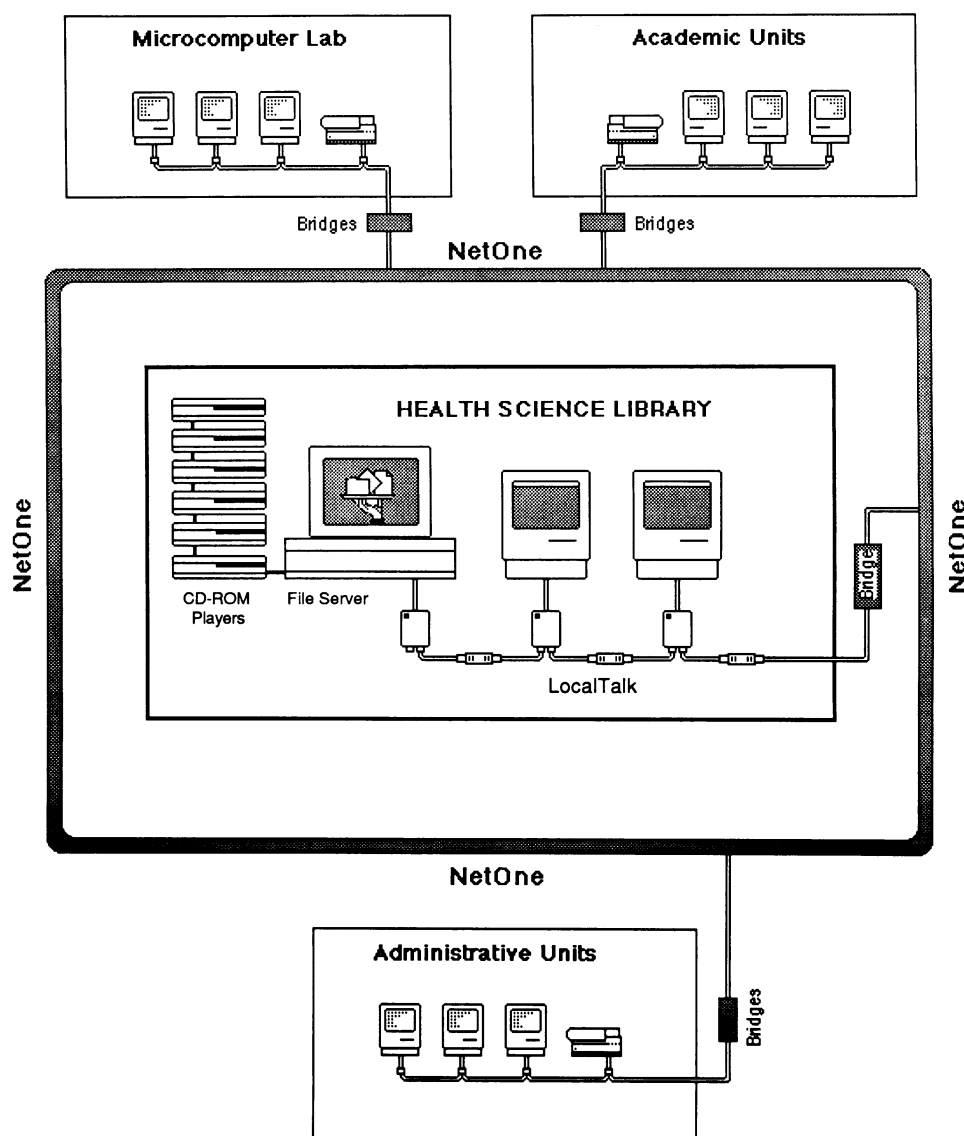
In the ten months since the library's five Knowledge Server work stations were opened to the public, 36,406 searches were performed. This number included only those searches yielding at least one reference. Several Knowledge Server searches were usually performed to complete one "intellectual search" since users must conduct one search for each of the six yearly volumes of the MEDLINE data kept online, or may need to try several search queries to find the desired references. Based on two months' of Knowledge Server report data, library users searching at library work stations accounted for 83.3% of Knowledge Server use, outside users accounted for 10.6%, and library staff 6.0% (Figure 4, n = 11,833 searches). Comments from users included

- "It was a pleasure."
- "Easy to use and rapid service."
- "I really liked getting printouts of selected articles."
- "This is the best thing since sliced bread."

When Knowledge Server was first installed, only the BIT Center, the Computer Lab, and the Radiology Department could access the database over a Fastpath box bridge. Since then, seventeen additional Fastpath boxes have been installed to connect departmental LocalTalk networks to the campuswide NetOne network so that MEDLINE Knowledge Server can be searched from office or lab. There are now approximately 215 Macintosh work stations in various campus buildings available for searching Knowledge Server. The system has proved so popular that the

§§ Knowledge Finder and Knowledge Server are trademarks of Aries Systems Corporation.

Figure 3
Configuration scheme of NetOne and LocalTalk networks



BIT Center maintains a Fastpath Box waiting list for departments requesting an installation.

IMPACT ON LIBRARY STAFF

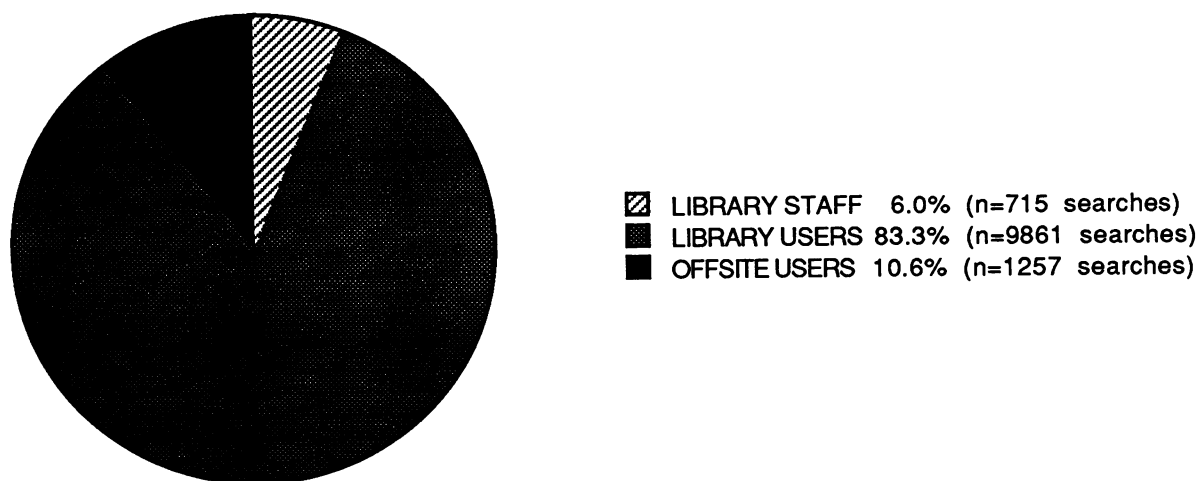
New library services can affect the kind and amount of work performed by the library staff. Anders and Jackson found that mediated online searching decreased considerably after CD-ROM versions of four databases were installed [14]. Carey and Masey-Burzio noted that online searching decreased by 30% after a

SilverPlatter*** MultiPlatter system was installed on a local area network [15]. Martin found an increase in ILL activity after the introduction of online searching in a small technical library [16]. Barringer and Frisch experienced a similar increase in ILL activity following the introduction of free online search days [17].

The percentage change in the number of photo-

*** SilverPlatter is a registered trademark of Silverplatter Information, Inc.

Figure 4
Knowledge Server users (n = 11,833 searches)



copy, ILL, and online mediated search requests processed by library staff for the months May 1989 to February 1990 was calculated using the average of the corresponding months in the four previous years. These values are graphically displayed in Figure 5. The number of searches conducted using Knowledge

Server and miniMEDLINE are plotted by month in Figure 6. It appears that while the use of miniMEDLINE and Knowledge Server increased from May 1989 to February 1990 (Figure 6), a dramatic decrease in mediated online searches occurred during those months (Figure 5).

Figure 5
Changes in library services after installation of Knowledge Server and miniMEDLINE (May 1989–February 1990)

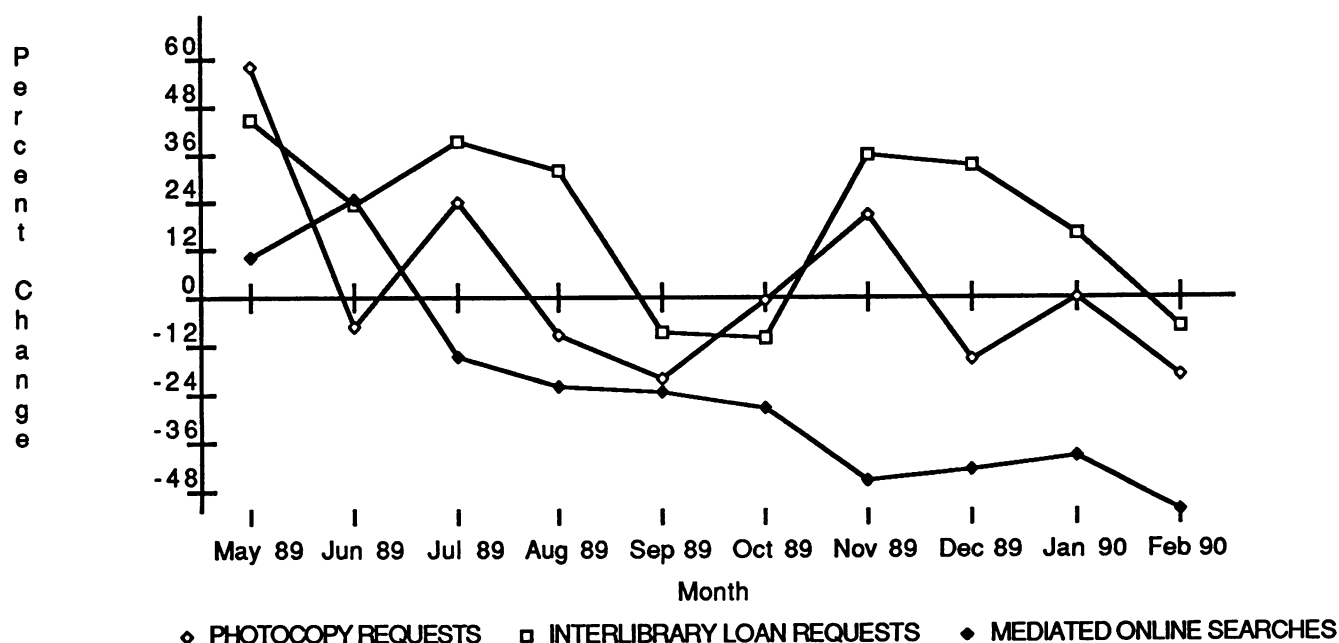
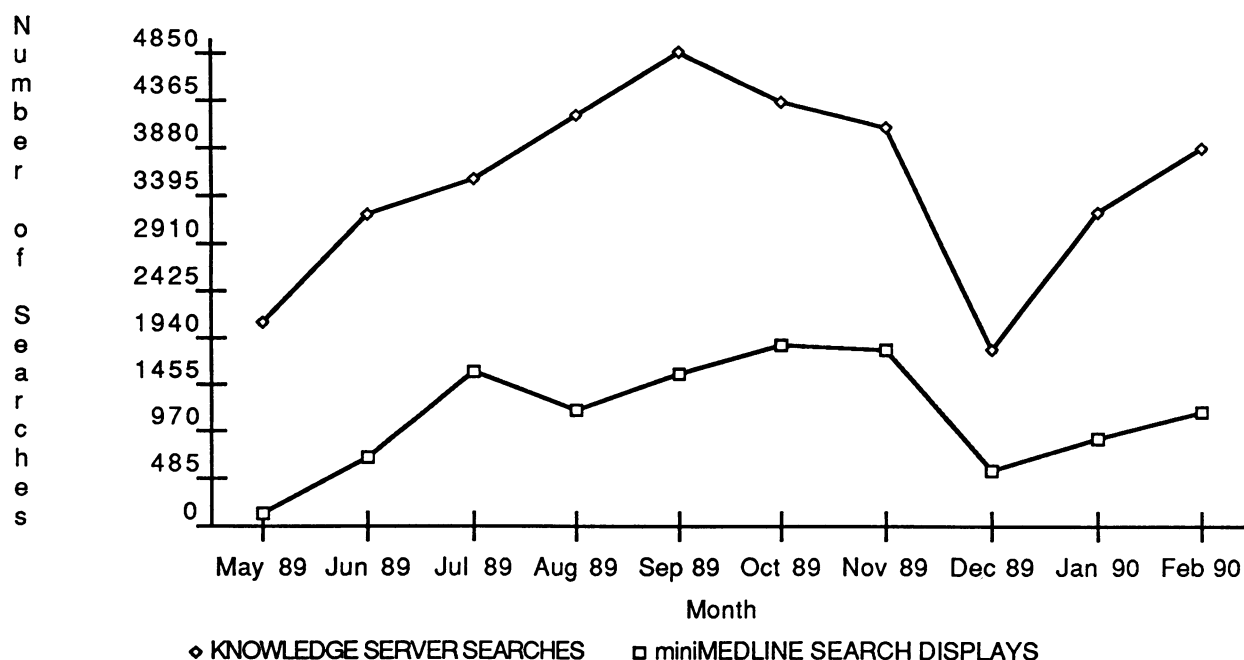


Figure 6
Knowledge Server and miniMEDLINE searches (May 1989–February 1990)



The monthly average changes in mediated online searches, ILL requests, and photocopy requests were calculated for the months July 1989 through February 1990. Since the new searching services became available for use in May 1989, it was believed that there would be a lag time in users learning about the systems. Thus, the changes observed in May 1989 and June 1989 were not included in the calculations. The monthly average decrease for mediated online searches was 33.4% ($n = 8$). The monthly average increase for ILL requests was 16.4% ($n = 8$), and the monthly average decrease for photocopy requests was 2.4% ($n = 8$). To determine whether the changes were statistically significant, one-tailed t tests were performed. The t test "is a statistical test involving a hypothesis about the population mean of a variable" [18]. It is used for a test of statistical significance when the sample size is thirty or less. The sample size of library service changes was eight. A one-tailed test is performed when only one possibility is of interest, e.g., the decrease in mediated online searches. The t value for changes in online mediated searches was -7.1 , which is significant at $p < .005$. The t value for changes in ILL requests was 2.1 , which is significant at $p < .05$. The changes in photocopy requests were not statistically significant ($t = -0.40$, $p > .1$).

While there was a significant decline in mediated online searching, it could not be determined at this time what proportion of the decline could be attributed to on-site, off-site, and library staff use of the searching systems. The decline in mediated online searches was not the result of reference librarians using Knowledge Server and miniMEDLINE for mediated searching. Staff searches accounted for only a small proportion of the total Knowledge Server searches. Knowledge Server and miniMEDLINE were used by reference librarians for trying out search strategies and looking up MeSH terms before searching MEDLINE online via NLM. Since the greatest proportion of Knowledge Server searching occurred at the library work stations, the largest proportion of the decline in online mediated search requests may be due to onsite user searching.

The ILL staff processed more requests since the installation of the new search services. However, miniMEDLINE was probably not responsible for the increase. Individuals searching for article citations in miniMEDLINE should be able to locate the article in the Health Science Library. Since only 9% of all ILL and photocopy requests were received via UTMENU, it was unlikely that UTMENU was responsible for the observed increase in ILL requests. Probably users

making requests through UTMENU would have made the request using paper forms had UTMENU not been available. If any new service was responsible for the increase, it would be Knowledge Server. Knowledge Server, as implemented at UT Memphis, contained six years of the unabridged MEDLINE database. By searching Knowledge Server, users could quickly retrieve a large number of article citations to journals not owned by the library. If Knowledge Server was responsible for the increase in ILL requests, the greatest proportion of those requests was probably due to onsite user searching.

By searching Knowledge Server, users could quickly retrieve a large number of article citations to journals not owned by the library. If Knowledge Server was responsible for the increase in ILL requests, the greatest proportion of those requests was probably due to onsite user searching.

Librarians at UT Memphis performed fewer online searches during the last eight months; however, they acquired new duties associated with the new services. These new duties included user training and system maintenance. The reference and systems staff developed instructional materials and held weekly workshops on the use of the LIS databases and Knowledge Server. In addition, the staff provided assistance to both onsite and offsite users. Classes covering the use of UTMENU and VAX Notes were included in the instruction provided by the staff of the BIT Center.

UTMENU and VAX Notes were maintained by the staff of the BIT Center. The systems librarian updated the miniMEDLINE database once a month, and BIT Center staff maintained the VAX computer on which the database resided. The Knowledge Server file server and its associated CD-ROM players resided in the systems librarian's office, and were maintained by the systems librarian. Unlike public, stand-alone systems, the CD-ROM disks remain in the players and were available for use twenty-four hours a day. Thus, there was no added work at the circulation desk in checking disks in and out. The system was updated quarterly and required only two or three hardware maintenance calls. Occasionally the file server "froze." This was a situation in which no mouse clicks or key presses elicited a response from either the file server or the work stations connected to it. Rebooting the file server solved this problem. One of the negative aspects of these services was that replacing paper and changing cartridges and ribbons for the public printers required additional low-level library staff activity.

POTENTIAL IMPACT ON THE UNIVERSITY COMMUNITY

Remote access to library services and electronic resources, available twenty-four hours a day, can be time-saving for the user. Without interrupting work for a library visit, the user may request a photocopy or ILL of an article, request or perform an online search, or search the library's catalog. After library hours, the user does not have to wait until the library opens to use these resources. The resident, needing a good reference on a patient care issue at 2:00 A.M., can log into miniMEDLINE and search the database. Reading the contents of the abstract may satisfy the information need. The clinician working on a paper for publication needs a copy of a journal article. A request for a photocopy of the article can be made by logging onto VAX and accessing UTMENU. The basic sciences researcher who is writing a grant to begin a new project can request an online search through UTMENU and receive the search results through VAX Mail. The search can be downloaded to a microcomputer, and the retrieved bibliographic information can be incorporated into a reprint file manager. Word-processing software, in conjunction with the reprint file manager, can be used to produce footnotes and formatted bibliographies in the production of grant applications [19-21].

Providing access to electronic information through the library over a campus network can also be economical for the institution. For instance, if the network at UT Memphis had not been implemented and each department wanted to search MEDLINE on CD-ROM, each department would have had to purchase its own MEDLINE CD-ROM subscription and CD-ROM players. With the campus network, the library can purchase one subscription and the necessary equipment and make the service available to everyone. In fact, one department dropped its subscription to MEDLINE Knowledge Finder when it discovered access was available through the library.

Remote access to the library is intended to supplement, not to supplant or discourage, in-house library use. One user, when told office access was available for MEDLINE Knowledge Server, explained that library searching was preferable; escape from the office and hiding in the library was welcomed now and again.

SUMMARY

Campuswide networks are providing an important opportunity for libraries to reach out to users beyond the confines of the library's walls. Instead of the library disappearing with the emergence of electronic information, it becomes just another node in the academic user's information network [22]. The library,

which can provide remote electronic access to its services and resources twenty-four hours a day, could potentially save users time and the institution money. Use data collected over a six-month period at UT Memphis indicated, however, that remote electronic access for requesting library services was used less frequently than were traditional methods. Knowledge Server and miniMEDLINE use data collected over a ten-month period at UT Memphis indicated that these locally maintained electronic databases were heavily used. Location data for searching the databases were available only for Knowledge Server. Based on two months of data, offsite searching occurred less frequently than onsite searching. Offering free onsite and offsite access to locally maintained electronic databases did affect the kind and amount of work performed by the library staff. The library staff performed fewer mediated online searches, processed more ILL requests, and assumed new duties related to user training and system maintenance.

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REFERENCES

1. MATHESON NW, COOPER JAD. Academic information in the academic health sciences center: roles for the library in information management. *J Med Educ* 1982 Oct;57(10,pt.2): 1-93.
2. *IBID.*, 55.
3. DRAKE MA. Library 2000-Georgia Tech: a glimpse of information delivery now and in the year 2000. *Online* 1987 Nov;11(6):45-8.
4. ROYSDON CM, ELLIOTT LE. Electronic integration of library services through a campuswide network. *RQ* 1988 Fall;28(1):82-93.
5. GRAINGER F, LADYMAN S. Integrating library functions into a general computing network. *ASLIB Proc* 1989 Mar; 41(3):109-17.
6. BIOMEDICAL INFORMATION TRANSFER CENTER, UNIVERSITY OF TENNESSEE, MEMPHIS. Networked resources enhance research. *EDU Mag* 1989 Fall;51:32-6.
7. HOWARD EH, JANKOWSKI TA. References services via electronic mail. *Bull Med Libr Assoc* 1986 Jan;74(1):41-4.
8. WEISE FO, BORGENDALE M. EARS: electronic access to reference service. *Bull Med Libr Assoc* 1986 Oct;74(4):300-4.
9. ROYSDON, op. cit.
10. BROERING N. The miniMEDLINE system: a library-based end-user search system. *Bull Med Libr Assoc* 1985 Apr;73(2): 138-45.
11. DALRYMPLE PW. Knowledge Finder at Rockford: evaluation of a CD-ROM MEDLINE system in a community-based medical school library and an outpatient clinic. In: Woodsmall RM, Lyon-Hartmann B and Siegel E, eds. *MEDLINE on CD-ROM*. Medford, NJ: Learned Information, 1989: 97-116.
12. DOYLE JD. Evaluation of MEDLINE Knowledge Finder: the system's features, users, and uses at the Good Samaritan Medical Center Library, Phoenix. In: Woodsmall RM, Lyon-Hartmann B and Siegel E, eds. *MEDLINE on CD-ROM*. Medford, NJ: Learned Information, 1989:117-34.
13. SMITH N, ANDERSON M, MCKEEHAN N. MEDLINE CD-ROM at Medical University of South Carolina Library: a comparative study of Knowledge Finder, miniMEDLINE, EBSCO, and MEDLINE. In: Woodsmall RM, Lyon-Hartmann B and Siegel E, eds. *MEDLINE on CD-ROM*. Medford, NJ: Learned Information, 1989:67-95.
14. ANDERS V, JACKSON KM. Online vs CD-ROM—the impact of CD-ROM databases upon a large online searching program. *Online* 1988 Nov;12(6):24-32.
15. CAREY J, MASSEY-BURZIO V. Installing a local area compact disk network. *Coll Res Libr News* 1989 Dec;50(11):988-91.
16. MARTIN JK. Computer-based literature searching: impact on interlibrary loan service. *Spec Libr* 1978 Jan;69(1):1-6.
17. BARRINGER SH, FRISCH P. Free online search days and interlibrary loan. *Coll Res Libr News* 1989 Feb;50(2):142-3.
18. CARPENTER RL, VASER ES. Statistical methods for librarians. Chicago, IL: American Library Association, 1978:114.
19. ROBERTS J. Reference Manager: online and keyboard bibliography entries. *Online Rev* 1986 Dec;10(6):331-5.
20. HOYLE N, MCNAMARA K. Biblio-Link and Pro-Cite: the searcher's workstation. *Database* 1987 Feb;10(1):73-8.
21. LANDAU T. D basic bibliography. *MacUser* 1989 Feb;5(2): 202-11.
22. SACK JR. Open systems for open minds: building the library without walls. *Coll Res Libr* 1987 Nov;47(6):535-44.

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